



# UNITED STATES PATENT AND TRADEMARK OFFICE

51  
UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

| APPLICATION NO.                   | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------------------------|-------------|----------------------|---------------------|------------------|
| 09/430,023                        | 10/29/1999  | TORU KOIZUMI         | 35.C13988           | 6679             |
| 5514                              | 7590        | 09/08/2004           | EXAMINER            |                  |
| FITZPATRICK CELLA HARPER & SCINTO |             |                      | AGGARWAL, YOGESH K  |                  |
| 30 ROCKEFELLER PLAZA              |             |                      | ART UNIT            |                  |
| NEW YORK, NY 10112                |             |                      | PAPER NUMBER        |                  |
|                                   |             |                      | 2615                |                  |

DATE MAILED: 09/08/2004

14

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

09/430,023

**Applicant(s)**

KOIZUMI ET AL.

**Examiner**

Yogesh K Aggarwal

**Art Unit**

2615

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 14 June 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 October 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 06/14/2004 has been entered.

***Response to Arguments***

2. Applicant's arguments filed 06/19/2004 have been fully considered but they are not persuasive.

**Examiner's response**

3. Applicant's arguments, with respect to claims 1 and 17 have been fully considered and are persuasive. The rejection of claims 1 and 17 as being anticipated by the Hayes reference has been withdrawn.

4. Applicant argues that Guidash patent does not disclose accumulating a photoelectric charge in the photodiode and then carrying out again the reset operation after reading out the photoelectric charge (e.g. col. 4 lines 47 state that the operation is done once per frame). The Examiner notes that the photo-detector 10 disclosed by Guidash in figure 3A is reset by turning both the transfer gate 16 and reset gate 17 and this is done once per frame (col. 4 lines 42-47) which means the process repeats in the next frame. Therefore in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (carrying out again the reset operation after reading out the photoelectric charge being done once per frame) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993)].

5. Applicant further argues that Guidash patent does not disclose simultaneously resetting the input section of an amplifier. The Examiner respectfully disagrees. As shown in the previous Office Action (Paper No. 10) the particular limitation of a "resetting the input section of an amplifier" is being addressed by Mendis reference

Art Unit: 2615

and not the Guidash reference as indicated in the amendment. Mendis discloses in figure 3 a reset switch R applying a reset voltage to the input terminal (leading out of the FD region) of the amplifier transistor.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-9, 11-13, 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guidash (US Patent # 5,986,297) in view of Mendis (CMOS active pixel image sensors for highly integrated imaging systems).

[Claims 1 and 17]

Guidash discloses a solid-state image pickup device comprising a photoelectric converter which stores an electric charge (12), a transfer switch (16) for transferring an electric charge from the photoelectric converter and a reset switch (17), wherein the device is adapted to input a pulse signal to the reset switch and the transfer switch in order to turn on the reset switch and the transfer switch simultaneously to thereby reset an electric charge at said photoelectric converter (see Fig 3A; col. 4, lines 43-44 and 46-47). Guidash further states that since the reset level can be obtained after a read operation, amplifier offset cancellation can be accomplished (col. 4, lines 52-54) and the process is repeated again for the next frame cycle, however, Guidash does not specifically disclose an input terminal for a signal amplifier, the transfer switch transferring electric charge to the input terminal and the reset switch applying a voltage to the input terminal.

However, Mendis discloses a CMOS active pixel sensor comprising a photoelectric converter, an input terminal for a signal amplifier (leading out of the floating diffusion (FD) region; see fig 3 (a)), a transfer switch (TX) for transferring electric charge to the input terminal and a reset switch (R) applying a voltage to the input terminal.

Art Unit: 2615

It would have been obvious to one having ordinary skill in the art at the time the invention was made that it is a well known configuration of an image pick-up device to have a lead from the FD region to an amplifier, as illustrated by Mendis, and to incorporate this configuration into the device of Guidash, and it is obvious to configure the device with an amplifier that provides a higher quality output signal.

**(Claim 2)** Guidash further discloses the reset voltage applied to the input terminal by means of the reset switch is selected to be higher than the depletion voltage defined as a reverse bias voltage sufficiently high for substantially depleting the semiconductor region of the photoelectric converter (see figs 3A and 3B; the higher reset voltage causing the region of the reset gate to be deeper than the region of the photoelectric converter causing the converter depletion as shown).

**(Claim 3)** Guidash further discloses the photoelectric converter comprises a buried type photodiode (see figs 1A and 1B).

**(Claim 4)** Guidash further discloses the transfer switch is a switch for depletion transferring the electric charge stored in the photoelectric converter (see figs 3A and 3B; col. 4, lines 42-46, 58-64).

**(Claim 5)** Guidash inherently discloses the transfer switch is a switch for transferring the electric charge stored in the photoelectric converter, leaving part of the electric charge in the photoelectric converter, in that there is not 100% charge transfer (col. 5, lines 25-30).

**(Claim 6)** Guidash further discloses the reset voltage is so selected as to make the potential energy of the input terminal lower than the potential energy of the photoelectric converter when the transfer switch and the reset switch are on (see figs 3A and 3B).

**(Claim 7)** Guidash further discloses that antiblooming is controlled by adjusting the electrostatic barrier to the vertical overflow drain (VOD) such that it is deeper than the off potential for the transfer gate (col. 6, lines 17-20), and that antiblooming control can be done similarly with a lateral overflow drain (LOD) (col. 6, lines 26-28). Mendis discloses the voltage for the transfer switch is 2.5V, and the voltage for the photoelectric converter is 5V (pg 189, section B, lines 1-9), thus the transfer switch is made half-open (because uses half the

Art Unit: 2615

voltage) to cause any excessive electric charge to flow to the input terminal during the storage period of the device. This is an alternate way of performing the antiblooming function.

**(Claim 8)** Mendis further discloses the resetting operation of turning on both the transfer switch and the reset switch is conducted on a row-by-row basis for the photoelectric converter (pg 189, section B, lines 11-15).

**(Claim 9)** Guidash further discloses the architecture and method of operation taught eliminates image artifacts caused by line by line integration, wherein the simultaneous turn on of the transfer and reset switches is performed simultaneously for each pixel, and done once per frame. Thus, the resetting operation of turning on both the transfer switch and the reset switch is conducted at once for all the rows (col. 3, lines 20-24; col. 4, lines 42-47, 58-65).

**(Claim 11)** Mendis further discloses the photoelectric converter, the input terminal for a signal amplifier and the transfer switch are arranged on a same semiconductor substrate (see fig 3 (a)).

**(Claim 12)** Mendis further discloses the input terminal is a diffusion region (floating diffusion region (FD)) (see fig 3 (a)).

**(Claim 13)** Guidash further discloses the photoelectric converter is a photodiode comprising a first semiconductor region of a first conductivity type (P) formed in a semiconductor substrate, a second semiconductor region of a second conductivity type (N type within the photoelectric converter) located within the first semiconductor region and a third semiconductor region of the first conductivity type located between the second semiconductor region and an insulation film formed on the principal surface of the semiconductor substrate (portion illustrated between photoelectric converter (12) and film illustrated by the hatched portion; see figs 1 A and 1 B).

**(Claim 16)** Guidash further discloses a step of turning on the reset switch and the transfer switch simultaneously, before storing an electric charge, to eliminate an electric charge of the photoelectric converter (col. 4, line 41 – col. 5, line 41; reset operation performed first, followed by the frame integration operation, and then the transfer and storage operations).

Art Unit: 2615

7. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Guidash in view of Mendis as applied to claim 1 above, and further in view of Alford (5233428).

[Claim 10]

The combined invention of Guidash and Mendis discloses an image pickup device as discussed above, but does not specifically disclose the resetting timing of turning on both the transfer switch and the reset switch is modified depending on the quantity of light entering the photoelectric converter. Alford discloses an electronic exposure control system for a solid-state image sensor wherein exposure control is modified based on the quantity of light entering the sensor (see fig 2; col. 4, lines 54-64). It would have been obvious to one having ordinary skill in the art at the time the invention was made to reset the turning on of both the transfer switch and reset switch in the combined invention of Guidash and Mendis, in the manner taught by Alford in order to optimize exposure time for any light level. 8.

8. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Guidash and Mendis in view of Clark (6515701).

[Claim 14]

The combined invention of Guidash and Mendis discloses a solid-state image pickup device as discussed above, but does not specifically disclose a mechanical shutter for defining the exposure time of the solid-state image pickup device. Clark discloses an electronic exposure control system for an active pixel CMOS image sensor, and teaches that it is important to provide shutter means for limiting the exposure of pixels to incoming radiation, whether by using a mechanical shutter or electronic shutter (col. 1, lines 47-65).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate a mechanical shutter in the device of Guidash since, as taught by Clark, that shuttering means for an image sensor can be provided for by either a mechanical shutter or electronic shutter. Using a mechanical shutter would be further obvious in that it would provide a simpler construction for an imaging device because there will not be a need to shield parts of the device as performed by Guidash. 9.

Art Unit: 2615

9. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Guidash and Mendis in view of Clark as applied to claim 14 above, and further in view of Mizoguchi (5959669).

[Claim 15]

The combined invention of Guidash, Mendis and Clark discloses a solid-state image pickup device as discussed above, but does not specifically disclose the photoelectric charge storage period is defined by the resetting operation of the solid-state image pickup device and the opening/closing operation of the mechanical shutter. Mizoguchi discloses an image pickup apparatus wherein one of the exposure methods used is a hybrid shutter method in which charge storage for an exposure cycle is started by clearing charge by means of an electronic shutter and the exposure cycle is completed by closing iris blades (35a and 35b) of a mechanical shutter (col. 14, lines 26-29, 45-62). It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate an electronic shutter and mechanical shutter in the combined image pickup device of Guidash, Mendis and Clark, in the manner taught by Mizoguchi, in order to allow the device to perform photography on a line-by-line as well as a frame-by-frame basis, thus increasing the usability of the device.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yogesh K Aggarwal whose telephone number is (703) 305-0346. The examiner can normally be reached on M-F 9:00AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Christensen can be reached on (703) 308-9644. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.



Art Unit: 2615

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

YKA  
September 2, 2004

  
TUAN HO  
PRIMARY EXAMINER